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in *Carcharias* and full in *Carcharodon*, though a careful comparison will reduce the number of established species of fossil Carcharodons. He had also discovered new genera of *Scates*. Of the three fossil genera, *Myliobates*, *Zygobates*, and *Aëtobates*, the first is found living in the Old World, while the second and third are unknown there, except as fossils; all these genera have been found living in North and South America. Of the genus *Raia*, of which there are vast numbers in Europe, the number is diminished in America by at least one third.

Professor Peirce made a communication on a new view of the fundamental principles of Analytic Mechanics.

Three hundred and eighty-eighth meeting.

November 17, 1853. — ADJOURNED QUARTERLY MEETING.

The PRESIDENT in the chair.

The time of this meeting was occupied in the transaction of business.

A communication was received from Mr. C. O'Brian, requesting permission to publish in a scientific periodical, about to be established in Cambridge, the proceedings of the Academy. The communication was referred to the Committee of Publication.

Three hundred and eighty-ninth meeting.

November 29, 1853. — SECOND NOVEMBER MEETING.

DR. CHARLES BECK in the chair.

Dr. Burnett made a communication on the development of organs, especially of those of glandular structure; in which he traced the progress from a mass of cells, arranging themselves in linear series, through the various stages of lateral saccations or diverticula, and the dichotomous ramifications dividing and subdividing to form the intricate structure of the organs. For instance, the ureter, first formed, undergoes this multiplied ramification till it forms the glandular structure of

the kidney. This arborescent character of organic development, homologous perhaps with the branching of polyps, reduces the process of development to an extremely simple formula.

Professor Agassiz observed that the heart, which he had studied especially in fishes, makes its first appearance as a mass of apparently homogeneous cells; the interior cells gradually soften, forming a cavity, the walls being at the same time proportionally solidified. He did not perceive the homology of the ramification described by Dr. Burnett to the branching of polyps; the buds of a polyp are not hernial sacs communicating primarily with the parent stem, but solid tubercles formed on the outside, gradually becoming hollow and communicating only secondarily with the main trunk.

Professor J. Wyman asked if, in the development of the liver, the cells were first formed, and the tubes extended from the intestine to meet them, as Bischoff maintains. Dr. Burnett had made no observations on this point in the vertebrated animals.

Professor Agassiz made a communication on a new living species of *Cestracion* from China, and on some fossil teeth of sharks of this family which he had received from the carboniferous formation of Indiana. From the examination of these specimens he thinks that all the genera but one — which he made long ago from the scanty materials in Europe (only a single jaw and some dried skins) — will stand; of the species he is not so confident.

The new species, from its distinct bands, he would call *Cestracion zebra*. It is thus characterized: a square-shaped head resembling that of *Ostracion*; the nostrils open into the mouth by a strong fissure; the mouth is small, more anterior than usual; there are singular cheek-like projections on the sides of the head; the body is massive, and much elevated on the back; the dorsal fins much falcated, especially the second; the gill fissures are usually in advance of the pectorals, but in this species the pectorals begin anteriorly under the third gill-fissure; the spiracles open below the eyes; the caudal fin

has its lower division two-lobed, the lower lobe looking like a second anal fin. The specimen, which he thought full-grown, was about one foot and a half long. The teeth in front differ much from those on the sides and back of the mouth; they are quite small in front, gradually becoming larger, and then again smaller; the anterior teeth are trilobed; the lobes gradually diminish backwards, become flat, and then rounded on their upper surface; there is a ridge on the median line, the remains of the three cusps. In the New Holland species, the front teeth have the median cusp much the longest, the back teeth being much the broadest.

Professor Agassiz compared these teeth with the fossil teeth he had received from Indiana. The teeth of the genus *Psammodus* resemble the back teeth of *Cestracion*, and are marked by numerous minute points; those of the genus *Strophodus* resemble *Cestracion*, having also a central prominence; in the genus *Ozodus*, the teeth are undulated, like the second form in *Cestracion*, but with lines radiating from each of the three cusps; in the genus *Helodus* (perhaps to be suppressed) the teeth have a prominent tubercle, like the anterior teeth of *Psammodus*; another reason for suppressing the former genus is that it is always found with the latter; in the genus *Petalodus* the teeth are much compressed and spreading, with a narrow root.

These are the same genera as are found in Europe; the specific identity he had not as yet determined. Other European sharks having no living representatives are also found here. The genus *Ctenoptychius*, the whole margin of whose teeth is serrated; the genus *Hybodus*, with cylindrical teeth, longitudinally striated, like those of Saurians, from the folds of the enamel; the genus *Dendrocladus*, having large dorsal spines, sometimes two feet long, which are always found with the teeth. Speaking of the gigantic species which must have borne these spines, he remarked that it was neither the first nor the last created members of any class in the animal kingdom which were the giants of that class; but rather those created at the middle epochs.

Professor Peirce made a communication, illustrated by diagrams, on the "collision of solid bodies." He believed that the speculations hitherto brought forward were radically defective, and comparatively useless ; the collision of atoms only had hitherto been considered, instead of combinations of atoms.

Three hundred and ninetieth meeting.

December 13, 1853. — SEMI-MONTHLY MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary announced a valuable bequest of books on the Infusoria, from the late Thomas Cole, Esq., of Salem, a Fellow of the Academy, consisting of Ehrenberg's great work, Kützing's Phycologia, Müller's Animalcula Infusoria, Johnston's Zoöphytes, and Recherches Chimiques et Microscopiques sur les Conferves, Bisses, Tremelles, etc., avec 36 Planches, par Girod-Chantrons (4to, Paris, 1802).

On motion of President Walker, the following resolutions were unanimously adopted : —

" *Voted*, That the American Academy feel very sensibly the kind remembrance of their lamented associate, Mr. Cole, in the valuable legacy now received, and would express their sincere thanks to Mrs. Cole for the delicate generosity with which she has invested the expressed intentions of her lamented husband with the authority of a bequest.

" *Voted*, That the Librarian be directed to affix to the volumes now presented a statement that they are a bequest from their late associate, Mr. Thomas Cole."

Professor Lovering made a verbal report on the letter of Mr. C. O'Brian, requesting an abstract of the Academy's proceedings, which had been referred to the Publishing Committee. He did not see any objection to furnishing such an abstract, thereby expressing the willingness of the Academy to grant the request, without implying any sanction or recommendation of the journal he was about to establish. It was

" *Voted*, That the Secretary be allowed to furnish to Mr. O'Brian such portions of the records of the Academy as he may think proper."